

Unit 3

Day 1

Section 2.3

Pure Imaginary Numbers and the Powers of i

NOTE - Please start a new section of your notebook.

PURE IMAGINARY NUMBERS

The square of the imaginary unit, which we denote by i , is -1 .

$$i^2 = -1$$

POWERS OF i

$$i^1 = i$$

POWERS OF i

$$i^1 = i$$

$$i^2 = -1$$

POWERS OF i

$$i^1 = i$$

$$i^2 = -1$$

$$i^3 = i^2 \cdot i = -1 \cdot i = -i$$

POWERS OF i

$$i^1 = i$$

$$i^2 = -1$$

$$i^3 = i^2 \cdot i = -1 \cdot i = -i$$

$$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$$

POWERS OF i

$$i^1 = i$$

$$i^2 = -1$$

$$i^3 = i^2 \cdot i = -1 \cdot i = -i$$

$$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$$

$$i^5 = i^4 \cdot i = 1 \cdot i = i$$

POWERS OF i

$$i^1 = i$$

$$i^2 = -1$$

$$i^3 = i^2 \cdot i = -1 \cdot i = -i$$

$$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$$

$$i^5 = i^4 \cdot i = 1 \cdot i = i$$

$$i^6 = i^4 \cdot i^2 = 1 \cdot -1 = -1$$

POWERS OF i

$$i^1 = i$$

$$i^2 = -1$$

$$i^3 = i^2 \cdot i = -1 \cdot i = -i$$

$$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$$

$$i^5 = i^4 \cdot i = 1 \cdot i = i$$

$$i^6 = i^4 \cdot i^2 = 1 \cdot -1 = -1$$

$$i^7 = i^4 \cdot i^3 = 1 \cdot -i = -i$$

POWERS OF i

$$i^1 = i$$

$$i^2 = -1$$

$$i^3 = i^2 \cdot i = -1 \cdot i = -i$$

$$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$$

$$i^5 = i^4 \cdot i = 1 \cdot i = i$$

$$i^6 = i^4 \cdot i^2 = 1 \cdot -1 = -1$$

$$i^7 = i^4 \cdot i^3 = 1 \cdot -i = -i$$

$$i^8 = i^4 \cdot i^4 = 1 \cdot 1 = 1$$

POWERS OF i

$$i^1 = i$$

$$i^5 = i$$

$$i^9 = i$$

$$i^2 = -1$$

$$i^6 = -1$$

$$i^{10} = -1$$

$$i^3 = -i$$

$$i^7 = -i$$

$$i^{11} = -i$$

$$i^4 = 1$$

$$i^8 = 1$$

$$i^{12} = 1$$

1. $i^{2049} = i^1 = i$

2. $i^{3873943} = i^3 = -i$

3. $i^{-17} = \frac{1}{i^{17}} = \frac{1}{i} \cdot \frac{i}{i} = \frac{i}{i^2} = -i$

4. $-i^{51} = -i^3 = -(-i) = i$

Definition of Equality- for real numbers a, b, c and d ,
 $a+bi=c+di$ iff (if and only if) $a=c$ and $b=d$.

$$a+bi = c+di$$

1. Find the real values of a and b .

$$a-10i = 7+12bi+8a$$

$$\underline{-7a-10i} = \underline{7+12bi}$$

$$\begin{array}{l} -7a=7 \\ a=-1 \end{array} \quad \begin{array}{l} -10=12b \\ b=-\frac{5}{6} \end{array}$$

2. Find the real values of a and b .

$$8i - 2(a - 5) = 2 + 2i(b + 4)$$

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